

# AMRAD NEWSLETTER

Amateur Radio Research and Development Corporation

December 1980

OUR DECEMBER 1 ANNUAL MEETING will provide an opportunity for you to meet the ARRL Washington Area Coordinator, Perry F. Williams, W1UED. It will also be a forum for discussion of League matters with Perry and an open discussion of AMRAD projects or other activities for 1981. As usual, the meeting will be held in the Patrick Henry Branch Library, 101 Maple Ave E, Vienna, VA. An interpreter will be provided for deaf attendees.

The planned 440-MHz repeater is a good topic for the meeting. One proposal is to make it a data-only repeater, possibly accepting only packetized data. The other concept would be to set it up like the present 2-meter repeater so that it can take either data or voice. Let's hear your views. Meanwhile, Sandy, WB5MMB is working on the 440-MHz repeater system and may need some help from time to time.

A hand-held RTTY station will be demonstrated at the annual meeting. It will consist of a VIP pocket-calculator-size Baudot terminal and a ICOM IC-2AT hand-held 2-meter transceiver. In addition to having two such hand-held RTTY stations talking to each other, one will be used to place a phone call to a TDD via the AMRAD WD4IWG/R repeater at Tyson's Corner. The idea behind this is to show how the deaf can have hand-held radio communications at a reasonable cost. The only hitch is that the user must have an amateur license of at least Technician class. That, of course requires an exam consisting of 5 words per minute Morse code and a radio theory test. How can the deaf hear Morse code? The answer is that they don't need to. Those with no hearing can use a small speaker and feel the vibrations or use a flashing light to read the code. AMRAD member Nan Sanders is learning code using a speaker. She says that the speaker is better when trying to distinguish one station from another when tuning a receiver through a CW band. It is possible that others would find the flashing LED or some other readout device easier for them to use. Ideas?

NOMINATIONS FOR DIRECTORS AND ALTERNATES were accepted and closed at the November meeting. Nominees were:

Dick Barth, W3HWN

Jeff Brennan, WB4WLW

Bill Pala, WB4NFB

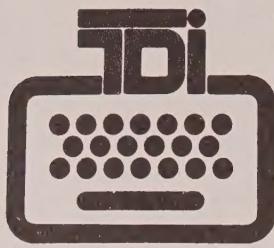
Elton (Sandy) Sanders, WB5MMB

Elections will be held at the annual meeting. Because we have 4 nominees to fill 4 positions (2 Directors, 2 Alternates), it is necessary to weight the votes in some manner. Therefore, we will mark ballots with the numbers 1, 2, 3 or 4 beside each name. The highest number will indicate the person you most want to see as a Director for the next two years. Those nominees receiving the least numerical votes will be Alternates for 1-year terms.

To vote, your dues should be paid up. If your dues are in arrears, please use the application blank in the back of the newsletter and either mail it in with your payment or bring it to the annual meeting a few minutes early.

If you cannot make it to the meeting and wish to cast an absentee vote, simply use a 7.62 cm x 12.7 cm card, write in the above names, add a number to each name indicating your preferences, seal it in an envelope with your name and return address on the outside only, and mail it to: AMRAD Vote, 1524 Springvale Ave, McLean, VA 22101. Please mail it immediately upon receipt of this newsletter.

PAPERS ARE SOUGHT for the 1981 ARRL Technical Symposium to be held on Monday evening, April 6, 1981 at the Capital Hilton Hotel, Washington, DC in association with the IEEE Vehicular Technology Society Annual Conference which runs April 6-8. If you are interested in giving a paper on mobile communications or other technical subjects, contact Paul Rinaldo, W4RI, 1524 Springvale Ave, McLean, VA 22101, 703-356-8918.



# THE DEAF AND THE TTY

Barry Strassler  
Executive Director  
Telecommunications for the Deaf, Inc.  
814 Thayer Avenue  
Silver Spring, Maryland 20910  
TTY 301-589-3006

## HOW DID A TTY BECOME A TDD?

Shortages have a way of creating new industries. The TTY is no exception. When shortages of donated TTY machines became acute during the seventies, jumping into the vacuum were prospective manufacturers of portable teletypewriters. Instead of being threatened with extinction, the deaf communications world was given a new and permanent lease on life. And as a consequence, the ranks of modem manufacturers were reduced from five to two, one in California and one in New Jersey. The noisy and cumbersome TTY disappeared from the deaf household, and in its place, a sleek and streamlined portable appeared.

Beginning with the television phone (not to be confused with the Bell System's Picture Phone), portable manufacturers, left and right, entered the market, ranging from a device no bigger than your shirt pocket to a heavy portable (better called a semi-portable).

Instead of one category, the modem category, two more were added -- the portable and the semi-portable. To the uninitiated, the choices appeared to be bewildering. But it boiled down to selecting a category the consumer preferred and then zeroing in on a particular brand in that category.

Then an identity crisis occurred. People

were still calling these portables TTY's, even the shirt-pocket sizes. This was seriously questioned since a TTY meant a teletypewriter, and by no stretch of imagination would a light portable be described as a TTY. Thusly, a deaf lady, a professional in social work circles, coined TDD as an abbreviation for telecommunication device for the deaf.

Strangely, the innocuous naming of a TTY as a TDD has sparked a series of debates. One prominent manufacturer said, "I believe that the TTY can mean all machines that the deaf people now use to talk on the telephone. A portable is a teletypewriter because it uses the same technology as a TTY."

A deaf writer wrote, "A TDD represents any device that will transmit messages over the telephone line, whether these messages are electrical, mechanical or electronic. And that the TTY is as old fashioned as the horse and buggy and that the TDD is the *in* term now."

In line with the trends, the name of the TDI was changed from Teletypewriters for the Deaf, Inc. to Telecommunications for the Deaf, Inc.

It is in America that words loosely describe their meanings. Thus a TDD is still called a TTY, by force of habit.

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VIRGINIA TECH, in Blacksburg, Virginia is running a series of workshops on microcomputer subjects, as follows: (1980)

Dec 8-9-10: Digital Electronics for Instrumentation and Automation

Dec 11-12-13: Microcomputer Interfacing Design and Programming Using the 8080, 8085 and Z-80

Dec 15-16-17: TRS-80 Microcomputer Interfacing, Programming and Scientific Instrument Automation

December 18-19-20: TRS-80 Microcomputer Scientific Applications Programming

December 18-19-20: Single Chip Microcomputer Programming, Interfacing, and Applications Using the Motorola 6801/68701 and 6803

The fee for each course is \$395. Credit is 1.8 CEU's per workshop. Contact: Adult Registrar, Donaldson Brown Center for Continuing Education, Virginia Tech, Blacksburg, VA 24061, 703-961-5182.

Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, D.C. 20554

In the Matter of )  
Use of Additional Digital ) RM-  
Modes in the Amateur Radio )  
Service )

PETITION FOR RULE MAKING

The American Radio Relay League, Incorporated, the nation-wide non-profit organization of amateur radio operators and enthusiasts with more than 150,000 members in the United States licensed by the Commission, respectfully requests that the Commission amend its rules to permit the use of digital techniques in the amateur bands above 50 MHz in addition to the already authorized techniques using International Morse and Baudot codes and the American Standard Code for Information Interchange (ASCII). It is apparent to the League that such rule making would facilitate and encourage amateur experimentation with new types of radio transmission, including but not limited to digital voice techniques, digitized video signals and computer to computer communications.

A Compelling Need Exists for the Use of Additional Digital Techniques by Amateurs

1. It is now quite clear that digital techniques are the leading edge of the "state of the radio art." If radio amateurs are to continue as the primary contributors to the advancement of that art, it will be necessary to permit them a wide scope of authority to conduct digital experiments than now exists.

2. Amateurs in other countries, perhaps with less formal rule making procedures, are already engaged in experimentation and operation with digital techniques other than Baudot and ASCII. In Canada, for example, packet networks are now being utilized. In the United Kingdom, a team at the University of Surrey is constructing Britain's first amateur satellite. The mission objective of the UOSAT spacecraft represents a departure from the traditional AMSAT-OSCAR satellites, the latter having been oriented predominantly towards providing improved long distance communications for amateur radio operators at vhf and uhf. UOSAT will complement the OSCAR series as an experimental and scientific amateur spacecraft. For instance, it is expected to utilize a synthesized-voice telemetry system. There will be an on-board microcomputer for image processing, telemetry and command management, and for data storage and dissemination. The UOSAT is scheduled for launch in September 1981 as part of the IRAS mission aboard a Thor-Delta rocket out of Vandenberg Air Force Base, California. Already, a simulation of the UOSAT slow-scan television image has been completed using TIROS-N image data. Just recently, the Department of Commerce in

Canada, in association with the company that was ANIK-B, a commercial satellite, has given Canadian amateurs a voice channel on the spacecraft, for "packet" radio communications.

3. (skipped)

4. U.S. amateurs, too, are ready for today's technology. For instance, a group of amateurs which includes ARRL Director Dr. Donald C. Miller, W9NTP, have recently renewed a Special Temporary Authorization (STA) for experiments with "medium scan television," which allows a moving image yet can be accomplished in narrow bandwidths. The AMSAT-OSCAR group, led by its president, Dr. Tom Clark, W3IWI, in August 1980 received an STA for tests of digital phase shift keying F1 emissions. Both of those experiments are to be conducted in the high-frequency bands where world-wide propagation is often available; thus, in those cases, the cautious approach of an STA rather than an immediate rules change seemed appropriate. However, the urge to experiment, exemplified by these two amateur projects can be encouraged and assisted to a degree far greater than as is provided through the use of an STA, by the allowance of additional digital techniques as a matter of course on the bands above 50 MHz where typical propagation extends to a few hundred miles at most.

Use of Additional Digital Techniques by Amateurs Is Consonant with the Communications Act and with the Purposes of the Amateur Service

5. It is incumbent on the Commission, pursuant to Section 303(g) of the Communications Act of 1934, to "study new uses for radio, provide for experimental uses of frequencies and generally encourage the larger and more effective use of radio in the public interest." Perhaps the best medium for study of such new uses and experimental techniques is the amateur service, due to its large number of innovative, technically oriented members. Thus, responsive to the above mandate of the Communications Act, the Commission has recognized as a basis and purpose of the Amateur Radio Service the "continuation and extension of the amateur's proven ability to contribute to the advancement of the radio art."<sup>1</sup> In the Radio Regulations promulgated by the International Telecommunication Union, the Amateur Service is defined<sup>2</sup> as "A service of self-training, intercommunication and technical investigation carried on by amateurs, that is, by duly authorized persons interested in radio technique solely with a personal aim and without pecuniary interest."<sup>3</sup>

continued →

<sup>1</sup>See Section 97.1(b) of the Commission's Rules

<sup>2</sup>Article I, Section II.

<sup>3</sup>A similar definition appears in Section 97.3(a) of the Commission's Rules.

6. On January 30, 1980, the Commission adopted a Third Report and Order in Docket 20777, providing for and establishing rules governing the use of ASCII, thus amending Section 97.69 of its Rules. Therein, it was stated that:

5. In other comments, amateur operators expressed interest in using radio-teleprinter codes other than Baudot or ASCII. Frequently cited examples were the Binary Coded Decimal (BCD), Extended Binary Coded Decimal Interchange Code (EBCDIC), Moore and Correspondence (IBM Selectric) codes. It was also felt that the Commission should allow the use of various "computer" or "machine" languages for computer-to-computer communication; and that the rules should provide for experimentation in the use of "packet switching" techniques. (Emphasis Added)

\* \* \* \* \*

7. Our intent in this proceeding was simply to expand the operating capabilities available to amateur radioteleprinter operators by providing for the use of ASCII. We find, however, that the comments generally go beyond our proposal and seek more or less total deregulation in the area of radioteleprinter operation. We are not necessarily opposed to such extensive deregulation; and we agree that it would be in perfect harmony with the basis and purpose of the Amateur Radio Service as articulated in Section 97.1 of the Rules. However, it is not clear that such an action would be consistent with Article 41 of the International Telecommunications Union (ITU) Regulations.<sup>6</sup> Additional exploration is needed to verify the literal and implied intent of Article 41 in relation to international radioteleprinter communications. (Emphasis Added).

\* \* \* \* \*

<sup>6</sup> A preliminary opinion on this matter is that Article 41, Section 2(1) (which states, in part, that "transmissions between amateur stations of different countries...shall be made in plain language") could be construed to allow the use of "standard" radioteleprinter codes for international communications, but no other type of radioteleprinter code whether it be used for experimental purposes or otherwise. However, Article 41 does not appear to prohibit the use of an unlimited number of radioteleprinter codes domestically. (Emphasis added).

Clearly, ample authority and precedent exists for a rule amendment to allow use of new, additional digital techniques in the VHF and UHF amateur bands, for domestic communications.

#### The League's Proposal

7. Given the above, the League proposes

amendment of Section 97.69 of the rules, to read as follows:<sup>4</sup>

#### §97.69 Digital transmission.

Subject to the special conditions contained in paragraphs (a) and (b) and (c) below, the use of the International Telegraphic Alphabet No. 2 (also known as the Baudot Code) and the American Standard Code for Information Interchange (ASCII) and other digital techniques may be used for such purposes (but not restricted to) radio teleprinter communications, control of amateur radio stations, models and other objects, transfer of computer programs or direct computer-to-computer communications, and communications in various types of data networks (including so-called "packet switching" systems): provided that such operations are carried out in accordance with the other regulations set forth in this Part.

(a) Use of the International Telegraphic Alphabet No. 2 (Baudot Code) and subject to the following requirements:

\* \* \* \* \*

(b) Use of the American Standard Code for Information Interchange (ASCII) is subject to the following requirements:

(1) The code shall conform to the American Standard Code for Information Interchange (ASCII) as defined in American National Standards Institute (ANSI) standard X3.4-1968.

(2) F1 emission shall be utilized on those frequencies between 3.5 and 21.25 28.0 MHz where its use is permissible; and the sending speed shall not exceed 300 bauds. A1 emission may also be used for ASCII where F1 is permitted.

(3) On frequencies between 28.0 and 28.5, F1 emission may be used; and the sending speed thereof shall not exceed 1200 bauds.

(4) F1, F2 and A2 emissions may be utilized on those frequencies between 28.50 and 225 MHz where their use is permissible; and the sending speed shall not exceed 1200 4800 bauds.

(5) F1, F2 and A2 emissions may be utilized on those frequencies above 420 MHz where their use is permissible; and the sending speed shall not exceed 19.6 kilobauds.

(c) Use of digital techniques in addition to Morse, Baudot or ASCII is permitted on all amateur frequencies above 50 MHz except those on which only A1

<sup>4</sup> Words to be deleted have horizontal lines through them; suggested additional or changed wording appears in italics.

emission is permitted, subject to the following additional requirements:

(1) Bandwidth of a signal from a station using such digital techniques shall be no greater than that of a station using ASCII at the baud rate specified by Section 97.69(b)(3), (4) or (5), above for the band then in use.

(2) At the time a particular digital emission is first used from a given amateur station, an entry shall be made in the log of the station describing the system and the technique to be used, in sufficient detail so that such technique may be identified solely by that description. A similar entry shall be made when changes are to be made in the technique(s) in use.

(3) A station using such digital techniques shall identify the station in accordance with the requirements of Section 97.84 of these rules.

#### Discussion of Rule Proposals

8. Transmitters typically used for radiotelephony in the 50, 144 and 220 MHz amateur bands utilize phase or frequency modulation with a deviation of 5 kHz, and thus have a nominal bandwidth of 16 kHz. Under some techniques, it should be possible for amateurs to transmit ASCII at 4800 baud, with a shift of 5440 Hertz, and produce a bandwidth well within the accepted norm of 16 kHz. To encourage experimentation both with ASCII and with other additional digital techniques, as no penalty in assumed bandwidth, we are proposing to raise the allowed ASCII speed (and by inference the bandwidth for other digital techniques) from 1200 bauds to 4800 bauds on these bands.

9. On frequencies above 420 MHz, speeds of 19.6 kilobauds are permitted with ASCII, producing a nominal bandwidth of about 40 kHz. (Other wideband techniques are also possible under the proposed wording of Section 97.69(c)(1) to use additional digital techniques with similar nominal bandwidths.

#### Accountability

10. The Commission must consider the compliance prospects for any proposed rule changes. The League's proposal herein has been constructed with compliance in mind. First, the bands selected for additional digital experimentation and operation are above 50 MHz, where long distance communications are much less common than on the Amateur frequencies below 50 MHz. The League's present proposal is oriented toward domestic communications only. Normal identification procedures calling for identification at the beginning and end of every transmissions or series of transmissions, in accordance with the requirement of §97.84 of the Rules would

be adhered to.<sup>5</sup> These identifications will continue to be made either by telegraphy using the International Morse Code or by telephony, using the English language. The digital techniques in use will be described in detail in the station log, which must be available to the Commission for inspection, under the terms of Section 97.105 of the rules. A parallel situation has existed in the Amateur Rules for years, with respect to the use of foreign languages. The Commission has permitted its amateur licensees to use any foreign language so long as the identifications required by Section 97.84 have been given in English. Obviously, few amateurs and few of the Commission's monitoring staff are proficient in a variety of languages yet, so far as we are aware, few problems have arisen.

11. The Commission, on many occasions, has publicly commented on the generally high degree of amateur operator (compliance) with the rules relating to permissible communications;<sup>6</sup> this has been the foundation of the deregulatory approach. Given the largely local characteristic of expected digital transmissions under these proposed rules on the vhf and uhf bands, and the continued open identification procedures, we feel

<sup>5</sup> Although the League currently proposes use of Morse or voice identification in connection with use of the additional digital techniques, it is felt that discussion and consideration of alternative methods of identification in digital transmission is appropriate. Morse or voice identification in the context of, for example, packet switch techniques is interruptive and can be quite cumbersome for the operator. Nonetheless, accountability concerns expressed by others form the basis of the League's proposal in this regard at this time.

<sup>6</sup> For example, in the Third Report and Order, Docket 20777, supra, in connection with the suggestion that digital techniques in addition to ASCII be authorized, the Commission reported as follows:

Recognizing that under such an approach, it would be impossible for the Commission's enforcement personnel to intercept all radioteleprinter transmissions, several of those filing comments pointed out that amateurs have repeatedly demonstrated their ability to enforce self-imposed standards, and recommended that the Commission take an approach of adopting generalized and non-specific rules which deal only with the general form, and not the content of transmissions. Reference is made to the generally high degree of amateur operator compliance with the rules relating to permissible communications as the foundation for this deregulatory approach.

confident that the Commission can, in the main, rely for the negligible amount of "policing" desirable in this area on the constructive curiosity of amateurs as to a digital signal in general, and specifically one which might seem to display non-standard operating habits.

12. The local character of such transmissions would have the additional practical effect of necessitating "interoperability" or operation in accordance with accepted technical standards, because of the need to communicate. Even those oriented most toward experimentation would have the capability of conversion to more conventional "digital techniques" in short order, to facilitate coordination of experiments and to insure a wider range of stations to communicate with, especially in emergency contexts. It is thus anticipated that certain of the requested additional digital techniques will become more standardized as use of digital techniques increases. In short, the marketplace will determine which technique will prevail over time.

#### Conclusion

Wherefore, the premises considered, the American Radio Relay League, Incorporated respectfully requests that the Federal Communications Commission issue a Notice of Proposed Rule Making, proposing the amendment of its Rules to permit the use of additional digital techniques in the amateur bands above 50 MHz so as to provide for a wide range of digital experiments by amateurs, in furtherance of the purpose of the amateur radio service. It is further urged that action hereon be considered a priority matter for Commission action as a clear signal of the Commission's support of amateur radio experimentation.

Respectfully submitted,

The American Radio Relay League, Incorporated  
By Robert M. Booth, General Counsel

October 21, 1980

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THE ARRL RFI TASK GROUP has been reactivated. Here is its tentative charter:

#### Purposes:

- To educate amateurs and the public on RFI ... its causes and cures.
- To encourage the manufacturers of electronic industrial and consumer electronic equipment to take those steps necessary to reduce the susceptibility of their equipment to strong RF signals.
- To encourage the manufacturers of amateur equipment to take those steps necessary to reduce the generation and radiation of spurious energy.

- To provide amateurs and the public with information as to whom requests for assistance can be directed when electronic industrial and consumer equipment is affected by RFI.
- To educate amateurs and the public on their rights and obligations in matters pertaining to RFI.
- To insure that visibility is given to the RFI problem in the popular and technical literature, and at technical forums attended by amateurs and manufacturers of amateur equipment and of electronic industrial and consumer equipment.
- To initiate, introduce and support RFI legislation in the Congress.
- To monitor and respond to proposals to impose local ordinances concerning RFI and to insure that these are fair and reasonable.

#### Activities:

- Give visibility to RFI in League publications, including articles in *QST*, material in *AMATEURADIO*, and updates of the RFI Handbook and The Radio Amateur's Handbook.
- Continually update the ARRL RFI Assistance List, and publish this list at least once a year.
- Maintain a dialogue on RFI with manufacturers of electronic home-entertainment equipment, with manufacturers of amateur equipment, and with the Federal Communications Commission.
- Test amateur equipment for the generation and radiation of harmonic radiation, and report findings in *QST*.
- Support RFI legislation in the Congress.
- Update and make available to League members a packet of information on RFI.
- Work for the publication in newspapers, news magazines, etc., of articles on RFI.
- Present papers on RFI at ARRL technical forums, IEEE meetings on electromagnetic compatibility, etc.
- Prepare material suitable for presentation at clubs, meetings, etc., on RFI (e.g., a film on RFI and its cures in cases where television receivers and hi-fi equipment is involved).
- Explore ways to educate electronics servicemen in the nature and correction of RFI and TVI.

If you are having RFI troubles, it would be helpful for you to send a brief description of the trouble, name of the device and its manufacturer, approximate age of the device and model or serial number if known to Hal Richman, W4CIZ, Technical Advisor, ARRL RFI Task Group, 3908 Lake Blvd, Annandale, VA 22003. If the manufacturer has been helpful in solving the problem, please include that fact and the name of your contact in the company. AMRAD members with both amateur radio equipment and computers are urged to send Hal information on the RFI encountered.

THE BEAM HEADING PROGRAM which we reprinted in the August issue was somewhat flawed. Roy A. Cartier, K4AC tried to load it in his SWTP 6800. After correcting some typos in the article, the program would run until he tried some headings to locations with negative latitude or longitude, then it would not run. The equation in 820 would not handle negative cosines; it would require a logarithm of a negative number.

Roy had a program for some time which works in all quadrants so he went to work on it to give it all the features of the WØTG program. A listing is printed below.

(Ed. Note: The listing wouldn't reproduce so I retyped it - without typos, of course - using an IBM OCR element. You should read { as (, } as ), \* as \*, and ^ as ". Good luck!

```

0010 REM BEAM HEADING AND DISTANCE PROGR
AM NO.1-9880, 9 AUG.80
0020 PRINT "THIS PROGRAM CALCULATES BEAM
HEADINGS AND DISTANCE FOR K4AC"
0030 PRINT "COORDINATES FOR K4AC ARE:"
0040 PRINT "LATITUDE = N 39.18, LONGITUD
E = W 78.17"
0050 PRINT "SPECIFICATIONS ARE IN DECIMA
L DEGREES"
0060 PRINT "WITH SOUTH LATITUDE AND EAST
LONGITUDE NEGATIVE"
0065 PRINT "TO CLEAR MISTAKE IN ENTRY AD
D : EB AND RETURN"
0070 INPUT "DO YOU WANT A DIFFERENT ORIG
IN",A$
0080 IF LEFT$(A$,1)="Y" GOTO 110
0090 A=39.18 : B=78.17
0100 GOTO 130
0110 INPUT "WHAT IS THE LATITUDE OF THE
NEW ORIGIN",A
0115 IF A>1.0E6 GOTO 110
0120 INPUT "WHAT IS THE LONGITUDE OF THE
NEW ORIGIN",B
0124 IF B>1.0E6 GOTO 120
0125 GOTO 130
0126 PRINT " ORIGIN IS : ";A;" , ";B
0130 INPUT "WHAT IS THE LATITUDE OF THE
DESTINATION",C

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0135 IF C>1.0E6 GOTO 130
0140 INPUT "WHAT IS THE LONGITUDE OF THE
DESTINATION",D
0145 IF D>1.0E6 GOTO 140
0150 A9=.01745329 : E=A*A9 : F=B*A9 : G
=C*A9 : H=D*A9
0160 J=SIN{E}*SIN{G}+COS{E}*COS{G}*COS{H-F}
0170 I=ABS{J}
0175 F1=0
0180 K=ATAN{SQR{1-I*I}}/I
0190 IF J<0 THEN K1=3.14159265-K : GOTO
210
0200 K1=K
0210 X=SIN{G} : Y=SIN{E}
0220 B1=X-{Y*J} : B2=SIN{K1}*COS{E}
0230 P1=B1/B2 : P=ABS{P}
0234 IF P>1 THEN P=1
0240 Q=ATAN{SQR{1-P*P}}/P
0250 IF P1<0 THEN R=3.141592651 - Q : GO
TO 265
0260 R=Q
0265 S=SIN{H-F}
0270 IF S<0 THEN F5=5
0280 IF S>0 THEN F5=0
0290 IF F5=5 THEN R1=R : GOTO 310
0300 R1=6.283185308 - R
0310 R2=R1*57.29577951
0320 IF F1=1 GOTO 340
0330 PRINT "HEADING ",R2
0335 GOTO 350
0340 PRINT "RETURN HEADING",R2
0350 T=E : U=F : V=G : W=H
0360 E=V : G=T : F=H : H=U
0370 IF F1=1 GOTO 390
0375 F1=1
0380 GOTO 210
0390 GOSUB 500
0400 INPUT "DO YOU REQUIRE MORE ",Q$
0410 IF LEFT$(Q$,1)="Y" GOTO 126
0420 STOP
0500 K9=K1*57.29577951
0510 PRINT "STATUTE MILES = ",K9*69.097
0520 PRINT "NAUTICAL MILES = ",K9*60.0
0530 PRINT "KILOMETERS = ",K9*111.1
0540 PRINT
0550 RETURN
0560 STOP
0600 REM AMRAD REVISED

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**AMRAD**

**Amateur Radio Research and Development Corporation**

**Membership Application/Renewal**

Mail to: Gerald Adkins, Treasurer  
1206 Livingston St N  
Arlington, VA 22205

	Annual	Life
Dues: Regular	\$12	\$120
2nd in family	6	60
Full-time student	3	-

Please make checks payable to AMRAD.

Name \_\_\_\_\_  
Ham \_\_\_\_\_ Home \_\_\_\_\_  
Call \_\_\_\_\_ Phone( ) \_\_\_\_\_  
Address \_\_\_\_\_  
City, \_\_\_\_\_  
State, \_\_\_\_\_ ZIP \_\_\_\_\_  
I agree to support the purposes of the Corporation.

Class License \_\_\_\_\_  ARRL Member \_\_\_\_\_  
Have:  2-meter FM \_\_\_\_\_  RTTY \_\_\_\_\_  
 Computer model \_\_\_\_\_  
 Microprocessor type \_\_\_\_\_

Signature \_\_\_\_\_

THE AMATEUR RADIO RESEARCH AND DEVELOPMENT CORPORATION is a technically oriented club of about 300 radio and computer amateurs. It is incorporated in the Commonwealth of Virginia and is recognized by the Internal Revenue Service as a tax-exempt scientific and educational organization.

THE PURPOSES OF THE CLUB are to: develop skills and knowledge in radio and electronic technology; advocate design of experimental equipment and techniques; promote basic and applied research; organize forums and technical symposiums; collect and disseminate technical information; and, provide experimental repeaters.

MEETINGS ARE ON 1st MONDAY of each month at 7:30 p.m. at the Patrick Henry Branch Library, 101 Maple Ave E, Vienna, VA. If the 1st Monday is a holiday, an alternate date will be announced in the AMRAD Newsletter. Except for the annual meeting in December, meetings are normally reserved for technical talks - not business.

THE WD4IWG/R REPEATER is an open repeater for data communications (including RTTY), voice and experimental modes. It is located at Tyson's Corner, McLean, VA and has excellent coverage. It features a semi-private autopatch available to licensed members. Frequencies are: 147.81 MHz input, 147.21 MHz output. The head of the technical committee is Jeff Brennan, WB4WLW, 7817 Bristow Dr, Annandale, VA 22003, phone 703-354-8541.

THE AMRAD NEWSLETTER is mailed monthly to all members and to other clubs on an exchange basis. Technical articles, new product announcements, news items, calls for papers and other copy related to amateur radio and computing are welcome. Honorariums at a rate of \$10 per printed page (\$20 maximum per author per issue) are paid for original material accepted. Classified ads are free to members. Commercial ad inquiries are invited. The editor reserves the right to reject or edit any portions of the copy. Items should be mailed by the 8th of the preceding month to Paul L. Rinaldo, W4RI, Editor, 1524 Springvale Ave, McLean, VA 22101; phone 703-356-8918. Full permission for reprinting or quoting items appearing in the AMRAD Newsletter is granted provided that credit is given. Mailing is by 3rd Class bulk mail to U.S. addresses and 1st Class to Canada and Mexico. Overseas readers add 60¢ for surface or \$5.64 for air mail to annual dues.

THE AMRAD MESSAGE SYSTEM is an S-100 Computerized Bulletin Board System on 703-734-1387, system operator Terry Fox, WB4JFI. Terry's home phone number is 703-356-8334. The system accepts 110, 300, 450 and 600 baud ASCII callers using Bell 103-compatible modems.

THE HANDICAPPED EDUCATION EXCHANGE (HEX) is operated by AMRAD for those involved in education and communications for the handicapped. It accepts both 110/300-baud ASCII and deaf TTY callers. on 301-593-7033. The sysop Dick Barth, W3HWN's home phone is 301-681-7372.

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SPECIAL INTEREST GROUPS are formed from time to time. Currently we have SIG's on Deaf Communications and Spread Spectrum Communications. If you are interested in joining or forming a SIG, please contact Bill Pala, WB4NFB, 5829 Parakeet Dr, Burke, VA 22015; phone 703-323-8345.

TRAINING CLASSES are run as needed. Please discuss your training requirements with any Director.

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